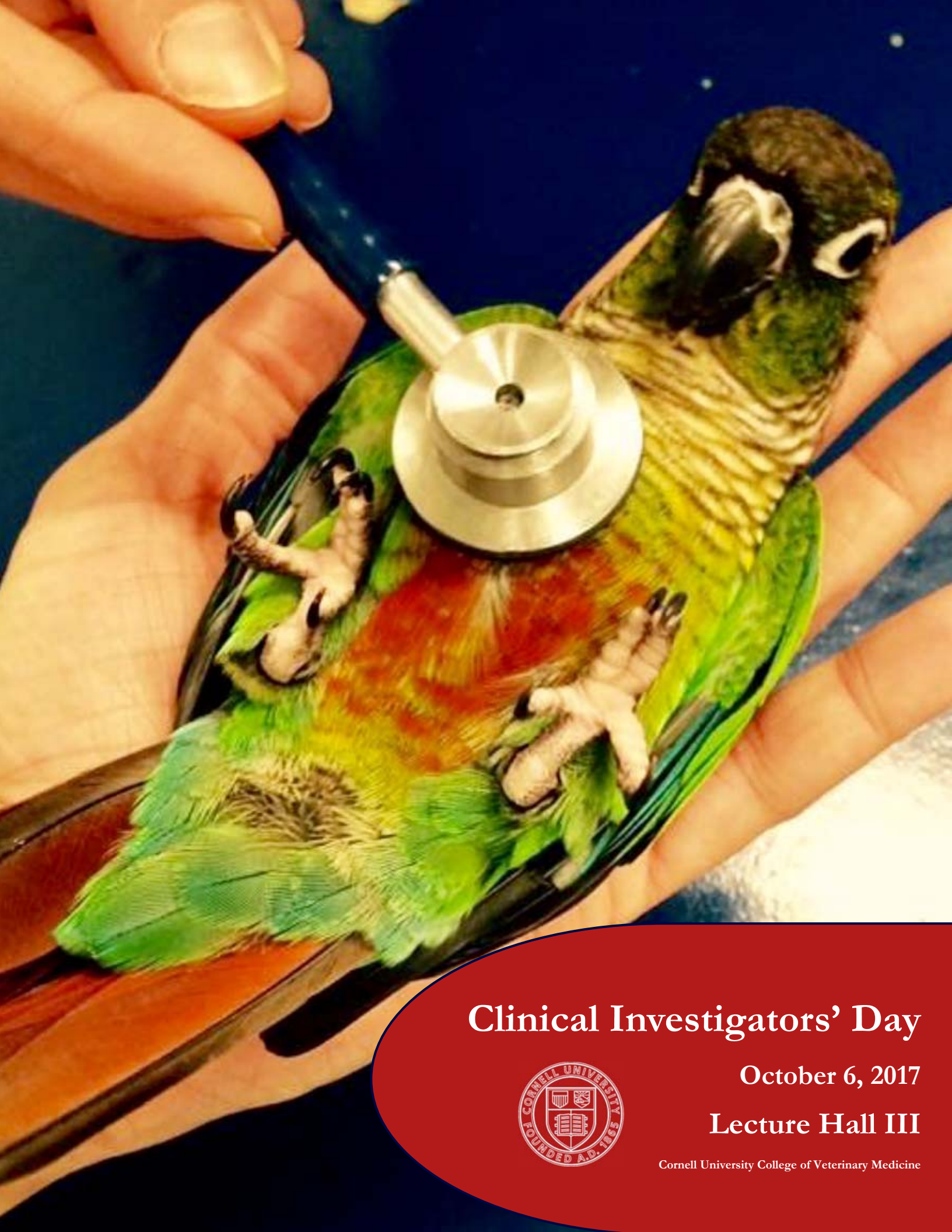

Clinical Investigators' Day

October 6, 2017

Lecture Hall III

Cornell University College of Veterinary Medicine

Cornell University
College of Veterinary Medicine

Welcome to the 2017 Clinical Investigators' Day, sponsored by the Cornell University College of Veterinary Medicine. The primary goal of this forum is to provide an opportunity for residents and interns to showcase ongoing investigations carried out at Cornell University College of Veterinary Medicine. It is our hope that greater insights will be gained in the breadth and depth of clinical investigations conducted at the College and will serve as a catalyst to promote greater interactions among colleagues with clinical and basic science research interests.

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Mr. Doug Fink
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Dr. Tracy Stokol, Co-Chair

The organizing committee thanks the following individuals who contributed to the success of the Day:

Mr. Andrew Amodeo
Mr. Dave Frank
Mr. Drew Kirby
Ms. Nancy Rice

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- Medications in the treatment of gastric squamous ulcers disease

For more information or to participate contact:

vet-research@cornell.edu or call 607.253.3279

Program Schedule

Friday, October 6, 2017
Lecture Hall 3, Veterinary Research Tower

9:30 am – 10:00 am **Morning Snack**

10:00 am – 10:15 am Welcome & Introductions – Dr. Erin Daugherity, DVM, MS, DACLAM

10:15 am – 10:45 am **Guest Presentation**

Unraveling the Links Between Lipid Metabolism and Thrombosis in Dogs

Erica Behling-Kelly, DVM, PhD, DACVP; Assistant Professor. Cornell University, Department of Population Medicine and Diagnostic Sciences

10:45 am – 11:45 am **Resident Presentations – Moderated by Andrew Miller, DVM**

- Acute Myeloid Leukemia and Lymphoma in Dogs Produce Mediastinal Masses That Are Indistinguishable on Thoracic Radiographs

  Erin E. Epperly – Diagnostic Imaging Resident **Pg. 1**

- Retrospective Study of Factors Associated With Infections in Tibial Plateau Leveling Osteotomy in Dogs

  Daniel J. Lopez – Small Animal Surgery Resident **Pg. 2**

- Evaluation of Percutaneous Dilatational Tracheostomy in Dogs: An Experimental Manikin and Cadaver Study

  Mariana A. Pardo – Emergency and Critical Care Resident **Pg. 3**

- Effects of Oral Raltegravir in Cats With Experimentally-Induced Ocular and Respiratory Feline Herpesvirus-1 Infection

  Chloe B. Spertus – Ophthalmology Resident **Pg. 4**

11:45 am – 12:00 pm **Break**

12:00 pm – 1:00 pm **Resident Presentations – Moderated by Heidi Reesink, VMD, PhD**

- Serum Metabolomics of Endurance Alaskan Sled Dogs During Racing

  Lauri-Jo Gamble – Sports Medicine and Rehabilitation Resident **Pg. 5**

- The Effects of Maltodextrin and Protein Supplementation on Serum Metabolites in Exercising Competitive Weight-Pulling Dogs

  Hyun-tae Kim – Clinical Nutrition Resident **Pg. 6**

Schedule (cont.)

- Evaluation of Atipamezole as Treatment for Dexmedetomidine-Induced Cardiovascular Depression in Anesthetized Cats

  Katheryn K. Zatroch – Anesthesia Resident **Pg. 7**

- Pilot Study on Pharmacokinetics, Safety, and Clinical Efficacy of Cannabidiol Treatment in Osteoarthritic Dogs

  Lauri-Jo Gamble – Sports Medicine and Rehabilitation Resident **Pg. 8**

1:00 pm – 2:00 pm **Lunch**

2:00 pm – 3:00 pm **Resident Presentations – Moderated by Bryant Blank, DVM, MS, DACLAM**

- Plasma Amylase and Lipase Concentrations in Captive Black-Tailed Prairie Dogs *(Cynomys Ludovicianus)*

  Christina E. McCullough – Companion Exotics Intern **Pg. 9**

- Prevalence of Anticoagulant Rodenticide Exposure in Red-Tailed Hawks *(Buteo Jamaicensis)* in New York State and Diagnostic Utility of Russell Viper Venom Test for Detecting Associated Coagulopathies

  Cynthia R. Hopf – Zoological Medicine Resident **Pg. 10**

- Ethanol as an Alternative to CO_2 for Euthanasia of Chickens *(Gallus Gallus Domesticus)* and Zebra Finches *(Taeniopygia Guttata)*

  Nathaniel S. Kollias – Laboratory Animal Medicine Resident **Pg. 11**

- Reference Intervals for Plasma Biochemical Parameters in Captive Black-Tailed Prairie Dogs *(Cynomys Ludovicianus)* Using Point-Of-Care Testing

  Christina E. McCullough – Companion Exotics Intern **Pg. 12**

3:00 pm – 3:15 pm **Break**

3:15 pm – 4:15 pm **Resident Presentations – Moderated by Erika Gruber-Hollingshead, DVM**

- Clinical and Radiographic Abnormalities Associated With Retained Tooth Roots in Dogs

  Kevin K. Ng – Dentistry and Oral Surgery Resident **Pg. 13**

- Syringobulbia in Dogs

  Baye G. Williamson – Neurology and Neurosurgery Resident **Pg. 14**

- Validation of an Equine Stall-Side Major Crossmatch Test

  Araba D. Bortsie-Aryee – Clinical Pathology Intern **Pg. 15**

- Consequences of Subtherapeutic Antibiotic Environmental Contaminants in a Zebrafish *(Danio Rerio)* Model

  Rachael Labitt – Laboratory Animal Medicine Resident **Pg. 16**

4:15 pm – 5:00 pm **Keynote Address**

Tick-Borne Disease: Translating Research to Clinical Diagnostics

Dr. Laura Goodman, PhD; Senior Research Associate, Cornell University Department of Population Medicine and Diagnostic Sciences

5:00 pm **Award Presentations**

Dr. Lorin Warnick, DVM, PhD; Austin O. Hooey Dean of Veterinary Medicine

Following Awards **Reception** (**All Welcome!**)

Keynote Speaker

Dr. Laura B. Goodman, PhD; Senior Research Associate, Cornell University Department of Population Medicine and Diagnostic Sciences.

Dr. Goodman is an emerging infectious disease researcher at the Cornell College of Veterinary Medicine, focusing on pathogen discovery, surveillance, and bridging the gap between research and diagnostics. She leads the development efforts in the Molecular Diagnostics section of the Cornell Animal Health Diagnostic Center / New York State Veterinary Diagnostic Lab.

Her research investigates mechanisms of pathogen emergence and development of novel high-throughput testing methods. Her thesis work established causal evidence of the connection of equine herpesvirus 1 neuropathogenicity with a viral mutation. Current focus areas in the lab are in emerging tick-borne diseases and antimicrobial resistance.

Dr. Goodman trained at the University of Michigan, Cornell, and Harvard and is an active member of the American Association of Veterinary Laboratory Diagnosticians.

Guest Speaker

Dr. Erica Behling-Kelly, DVM, PhD, DACVP; Assistant Professor Cornell University Department of Population Medicine and Diagnostic Sciences

Dr. Behling-Kelly earned her DVM from the University of Georgia and her PhD from the University of Wisconsin, Madison where she also completed a residency in clinical pathology.

She is interested in advancing our understanding of disease processes as well as improving our ability to diagnose disease. Her laboratory focuses on determining the pathogenic potential and diagnostic utility of serum lipoproteins in domestic species. In two of her on-going projects, she is investigating lipoproteins in the dog, relative to their ability to promote thrombosis in hyperlipidemic diseases (such as hyperadrencorticism) and the progression of renal disease. Another project is underway investigating changes in lipoproteins during various life-stages in dairy cows. She is also investigating the role of the erythrocyte and hemolysis in promoting thrombosis in the dog.

Moderators

Bryant Blank, DVM, MS, Dipl. ACLAM; Assistant Director, Agriculture Animals, Center for Animal Resources and Education (CARE) at Cornell University

Dr. Blank is a clinical veterinarian at the Center for Animal Resources and Education (CARE). He received his DVM from Kansas State University in 2009. He then completed a three-year veterinary residency in laboratory animal medicine at Cornell University. During this period he received his MS in Comparative Biomedical Sciences working on the pathogenesis of Listeria monocytogenes.

He currently provides clinical care for a variety of species, oversees multiple rodent vivaria, maintains regulatory oversight of large agricultural facilities, and assists in CARE's residency training program and veterinary student rotations. He is involved in multiple research collaborations involving a diversity of species and fields, including reproductive physiology of the Giant Pouched Rat, safety assessment of a synthetic joint lubricant, patient derived tumor xenotransplantation novel treatment studies and welfare parameters associated with trio-breeding of mice.

Moderators (cont.)

Erika Gruber-Hollingshead, DVM; Graduate Student, Cornell University Department of Microbiology and Immunology

Dr. Gruber graduated from the College of Veterinary Medicine at Cornell University in 2006. She completed a rotating internship in small animal medicine and surgery at Colorado State University in 2007, and then worked in small animal practice in Tennessee for three years. She returned to Cornell in 2010 for a residency in clinical pathology and was board-certified by the American College of Veterinary Pathologists in 2013. During her residency, Dr. Gruber conducted research on tissue factor-mediated thrombin generation by canine cancer cells.

She is currently a graduate student in the Department of Microbiology & Immunology at Cornell, and is investigating how physical properties of the extracellular environment regulate macrophage response to inflammatory stimuli. Dr. Gruber is passionate about veterinary medicine, biomedical research, and maintaining a healthy work / life balance.

Heidi Reesink, VMD, PhD, Assistant Professor of Large Animal Surgery, Cornell University Department of Clinical Sciences

Dr. Reesink received her VMD from University of Pennsylvania in 2007 and completed a large animal residency at Cornell University in 2012. She received her PhD in Comparative Biomedical Sciences from Cornell in 2016. This same year she accepted the position of Assistant Professor in the Department of Clinical Sciences.

Her laboratory aims to unravel basic mechanisms underlying the development of orthopedic disease and to pioneer innovative therapies for the treatment of joint injury and arthritis in equine and human athletes. Dr. Reesink's clinical interests include large animal orthopedic surgery, equine sports medicine, lameness and emergency surgery. She is interested in translating novel research discoveries, including regenerative medicine, stem cell therapy, and lubricin therapy, to equine clinical patients with musculoskeletal disease.

Andrew Miller, DVM; Assistant Professor and the Anne Groot Sesquicentennial Fellow, Department of Biomedical Sciences, Section of Anatomic Pathology, Cornell University College of Veterinary Medicine

Dr. Miller earned his DVM degree from Cornell University and is board certified by the American College of Veterinary Pathologists (ACVP). He was an Assistant Professor and Comparative Pathologist at Harvard Medical School from 2008-2013 before his current position at Cornell University.

His research interests focus on the pathogenesis and molecular alterations of intracranial neoplasia, soft tissue sarcoma, and hepatocellular carcinoma, predominately in the dog. Dr. Miller is also focused on studying the role that tumor-associated inflammation has in the progression and ultimate patient outcome in a variety of canine and feline neoplasms. In addition, he is co-director of the anatomic pathology residency program and is active nationally in the ACVP.

Judges

Theodore G. Clark, PhD; Professor of Parasitology and Immunology, Cornell University Department of Microbiology and Immunology

Dr. Clark joined the Department of Microbiology and Immunology in 1996 and is currently Director of the Graduate Field of Immunology and Infectious Disease. Dr. Clark received a BS from Columbia University, a PhD from the State University of New York at Stony Brook, and was a Postdoctoral Fellow in the Department of Biology at Yale University.

Over the years, his research has been supported by grants from the National Institutes of Health, the National Science Foundation, the Department of Defense and the U.S. Department of Agriculture. He is a member of the Aquatic Animal Medicine Program in the College of Veterinary Medicine.

Susan Fubini, DVM; Professor of Large Animal Surgery; Associate Dean for Academic Affairs, Cornell University Department of Clinical Sciences

Dr. Fubini is a 1980 graduate of the University of Georgia, College of Veterinary Medicine. She completed a rotating large animal internship and surgical residency at Cornell University.

She is currently a Professor of Large Animal Surgery and Associate Dean for Academic Affairs at the College of Veterinary Medicine, Cornell University. Dr. Fubini is a member of the American College of Veterinary Surgeons. Her clinical expertise is in large animal soft tissue procedures. She lives in Ithaca with her husband, Dr. Rory Todhunter, a small animal orthopedist, their four active children, and three unruly dogs.

Dr. Hélène Marquis, DVM, PhD; Professor, Cornell University Department of Microbiology and Immunology

Dr. Marquis received her DVM from the University of Montréal and worked as a small animal clinician before returning to academia. She completed a M.Sc. at the University of Montréal and a Ph.D. at Texas A&M University, both in veterinary microbiology.

After finishing her post-doctoral training at the University of Pennsylvania, she assumed a faculty position at the University of Colorado, then moved to Cornell University. Dr. Marquis worked for many years on the pathogenesis of Listeria monocytogenes. More recently, her research has focused on fish health, disease, and nutrition. Actual projects include the effects of trace level antibiotics on intestinal microbiota, development of a phage-based diagnostic test for pathogenic Vibrio species, the use of insect larvae as a source of protein in fish feed, and skin mucus microbiota in health and disease.

Scott Palmer, VMD; Adjunct Professor, Cornell University Department of Population Medicine and Diagnostic Sciences; New York State Equine Medical Director

Dr. Palmer is a renowned veterinarian who, as the New York State Equine Medical Director, oversees the health and safety of horses at all New York State Thoroughbred and Standardbred racetracks.

Since graduating from the University of Pennsylvania, School of Veterinary Medicine in 1976, Dr. Palmer has worked as a staff clinician at the New Jersey Equine Clinic, serving as the Hospital Director from 1997 through 2013. He is a two-time recipient of the New Jersey Equine Practitioners Veterinarian of the Year award, as well as a recipient of the AAEP President's Award in 2009 and the AAEP Distinguished Service Award in 2010. Dr. Palmer is board certified in equine practice by the American Board of Veterinary Practitioners and has authored dozens of peer-reviewed publications and is a featured speaker at veterinary conferences world-wide.

Judges (cont.)

Mark Rishniw, BVSc, MS, PhD; Adjunct Professor, Cornell University Department of Clinical Sciences

Dr. Rishniw received his BVSc from University of Melbourne in 1987 before completing an MS and residency in small animal internal medicine at Washington State University in 1994. He completed a cardiology residency at UC Davis in 1996 and then the Doctor of Philosophy from Cornell University in 2009.

Dr. Rishniw was a Lecturer in Cardiology at Cornell and is board certified by both the American College of Veterinary Internal Medicine and the American College of Veterinary Internal Medicine (Cardiology). He has been Director of Clinical Research at VIN for the past 12 years, and is an adjunct professor at Cornell University. When not at work, Dr. Rishniw can usually be found on his bicycle.

Erin Epperly, DVM

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Institution and Location	Degree	Year
Colorado State University, Ft. Collins, Colorado	DVM	2007
Cornell University, Ithaca, New York	Residency	2015-Present

Current Position

Resident, Diagnostic Imaging, 3rd Year

Abstract Title:

Acute Myeloid Leukemia and Lymphoma in Dogs Produce Mediastinal Masses That Are Indistinguishable on Thoracic Radiographs

Authors Names:

E. Epperly, K. R. Hume, S. Moirano, T. Stokol, J. Intile, H. Erb, P. V. Scrivani. Departments of Clinical Sciences (Epperly, Hume, Moirano, Scrivani) and Population Medicine & Diagnostic Sciences (Stokol, Erb), Cornell University, NY, 14853. Department of Clinical Sciences (Intile), North Carolina State University, NC, 27606

Project Mentor:

Peter V. Scrivani, DVM; Department of Clinical Sciences

Abstract:

Introduction/Purpose

Acute myeloid leukemia (AML), an uncommon hematopoietic neoplasm of dogs, should be differentiated from lymphoma because of a worse prognosis for AML. Detecting a mediastinal mass during thoracic radiography often prioritizes lymphoma, but we have observed mediastinal masses in several dogs with AML. We hypothesized that dogs with AML more frequently have a mediastinal mass than dogs with lymphoid neoplasia, and that the size of the mass is larger in dogs with AML.

Methods

A blinded diagnostic accuracy study was performed using archived records of dogs with hematologic neoplasia and technically acceptable thoracic radiographs. Routine descriptive statistical analysis, non-parametric hypothesis testing, and basic accuracy measures were performed.

Results

The sample population encompassed 238 dogs. A mediastinal mass was detected during thoracic radiography in 73/218 (33%) and 9/20 (45%) dogs in the lymphoid and AML groups, respectively; the difference was not statistically significant (P=0.21). Dogs with AML also did not have a larger mediastinal mass than dogs in the lymphoid group, both qualitatively (P = 0.50) and quantitatively (P = 0.96). In the sample population, detection of a mediastinal mass during thoracic radiography was inaccurate for differentiating AML from lymphoid neoplasia (area under the ROC curve, 0.55).

Discussion/Conclusion

Our results show that cranial mediastinal masses are equally common in dogs with AML and lymphoma, and that AML cannot be differentiated based on size of the mass. Our results indicate that AML should be on the differential diagnosis list of dogs with mediastinal masses.

Daniel J. Lopez, DVM

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Institution and Location	Degree	Year
Cornell University, Ithaca, New York	DVM	2016
Ontario Veterinary College, Guelph, Ontario, Canada	Intern	2016-2017
Cornell University, Ithaca, New York	Residency	2015-Present

Current Position

Resident, Small Animal Surgery, 1st Year

Abstract Title:

Retrospective Study of Factors Associated With Infections in Tibial Plateau Leveling Osteotomy in Dogs

Authors Names:

Lopez DJ*****, VanDeventer GM*****, Krotscheck U, Aryazand Y, McConkey MJ, Hayashi K, Todhunter RJ, and Hayes G.

***Co-first authors**

Project Mentor(s):

Galina M. Hayes, BVSc, PhD, DVSc; Department of Clinical Sciences
Rory J. Todhunter, BVSc, PhD; Department of Clinical Sciences

Abstract:

Introduction

Surgical site infections (SSI) are an important complication secondary to TPLO procedures and carry both functional and financial consequences.

Objective

To identify preoperative and intraoperative risk factors associated with SSI in dogs undergoing TPLO, specifically evaluating preoperative dermatitis.

Methods

Records of 320 dogs undergoing unilateral or bilateral TPLO (n=405) between 2007 and 2015, that were examined by a veterinarian at least 8 weeks postoperatively, were evaluated for the development of an SSI.

Results

Of 405 procedures, 8.4% developed a SSI. 18% of procedures were performed on dogs with active dermatitis, and 3% of procedures were performed on patients with active dermatitis at the surgical site. SSI incidence in these two subgroups was 10.2% (CI 4.5-21.3%, p=0.339) and 16.7% (95% CI=3.3-54.3, p=0.307) respectively. In univariable analysis, the German Shepherd Dog (GSD) was at 9.2 times greater odds of SSI compared to other breeds (95% CI=3.7-23.2, p<0.001). The highest risk surgeon had infection odds of 8.7 times greater compared with the lowest risk surgeon (95% CI=1.9-40.0, p=0.006). Additional significant risk factors identified included performing a meniscectomy (OR=2.07, 95% CI=1.03-4.15, p=0.04), surgical duration (OR=1.42, 95% CI=1.02-1.97, p=0.04) and body weight (OR=1.02, 95% CI=1.01-1.04, p=0.04). In a multivariable model, the association between GSD breed, performing a meniscectomy, and surgeon were retained.

Discussion

Identification of patients at increased risk for SSI allows for either targeted prophylactic antibiotic therapy or increased SSI monitoring and early intervention. Limitations of this study included underpowered analysis for cases with preoperative dermatitis and the retrospective nature of the study.

Mariana A. Pardo, BVSc, MV

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Institution and Location	Degree	Year
Universidad Mayor, Santiago, Chile	BVSc, MV	2009
University of Georgia, Athens, Georgia	ECC Internship	2013-2014
University of Florida, Gainesville, Florida	ECC Internship	2014-2015
Cornell University, Ithaca, New York	ECC Residency	2015-Present

Current Position

Resident, Emergency and Critical Care, 3rd Year

Abstract Title:

Evaluation of Percutaneous Dilatational Tracheostomy in Dogs: An Experimental Manikin and Cadaver Study

Authors Names:

Mariana A. Pardo[1], Julia Sumner[1], Adele Friello[2], Daniel J Fletcher[1], Robert Goggs[1]

[1]Department of Clinical Sciences, Cornell University College of Veterinary Medicine, Ithaca, New York
[2]College of Veterinary Medicine, Cornell University, Ithaca, New York

Project Mentor(s):

Robert Goggs; Cornell University, Department of Clinical Sciences, Ithaca, New York

Abstract:

Introduction

Percutaneous dilatational tracheostomy (PDT) has become standard of care for tracheostomy tube placement in people and offers potential advantages over conventional surgical placement (ST). This study aimed to evaluate feasibility of PDT in dogs through assessment of procedure time, ease of placement and complication rates for PDT compared to ST.

Methods

A randomized crossover experimental manikin and cadaver study involving six novice veterinary students was performed. Each student performed 10 PDT and 10 ST procedures on a training manikin, followed by 2 PDT and 2 ST procedures in a canine cadaver. Bronchoscopy and observer feedback was provided. Finally, PDT and ST were performed in unused cadavers using new equipment. Placements were timed, ease of placement scored using visual analog scales (VAS) and complications assessed by observers using ordinal scales (0-3). Cadaver tracheas were explanted post-procedure to evaluate anatomical damage scores (0-3). Time taken and VAS scores for ST and PDT procedures were analyzed using mixed-effects linear models, accounting for student, technique, and procedure number with post-hoc pairwise comparisons.

Results

Data are presented as median (range). For the final cadaver placement, there were no significant differences in placement time 188s (116-414) vs 300s (230-1020) (P=0.210), ease of placement 19mm (0-47) vs 38mm (21-57) (P=0.132), anatomical damage score 0 (0-1) vs 1 (0-2) (P=0.063), or equipment complications score 0 (0-0) vs 0 (0-1) (P=1.000) between ST and PDT respectively.

Conclusion

PDT can be performed as quickly, easily and safely as ST in canine cadavers by novice veterinary students.

Chloe B. Spertus, DVM

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Institution and Location	Degree	Year
Cornell University, Ithaca, New York	DVM	2015
University of Missouri, Columbia, Missouri	Rot. Internship	2016
Cornell University, Ithaca, New York	Residency	2016-Present

Current Position

Resident, Comparative Ophthalmology, 2nd Year

Abstract Title:

Effects of Oral Raltegravir in Cats With Experimentally-Induced Ocular and Respiratory Feline Herpesvirus-1 Infection

Authors Names:

Chloe B. Spertus[1], Matthew R. Pennington[2], Gerlinde R. Van de Walle[2], Zachary I. Badanes[1], Bonnie E. Judd[1], Hussni O. Mohammed[3], Eric C. Ledbetter[1]

[1]Department of Clinical Sciences, Cornell University, Ithaca, NY
[2]Baker Institute for Animal Health, Cornell University, Ithaca, NY
[3]Department of Population Medicine and Diagnostic Sciences, Cornell University, Ithaca, NY

Project Mentor(s):

Eric C. Ledbetter, DVM, DACVO; Department of Clinical Sciences

Abstract:

To determine the effects of oral raltegravir (Isentress®, Merck & Co., Kenilworth, New Jersey) treatment in cats with experimentally-induced ocular and respiratory feline herpesvirus-1 (FHV-1) infection.

A randomized, masked, vehicle-controlled, 30-day trial was performed using 14 nonvaccinated specific-pathogen-free cats with experimental FHV-1 infection induced by topical ocular inoculation. Cats received oral raltegravir (80mg) or vehicle (lactulose) capsules by mouth, twice daily, for 14 days. Cats were monitored after inoculation for 30 days. Ophthalmic examinations were performed every two days and ocular disease scores were calculated. Sneezing and nasal discharge were scored and respiratory rates were assessed every two days. Ocular samples for FHV-1 qPCR and virus isolation assays were collected every 3 days.

After inoculation, all cats developed ocular and respiratory disease typical of primary FHV-1 infection, including conjunctivitis and corneal ulceration. Using regression analysis, the raltegravir treatment group had significantly lower ocular disease scores, respiratory disease scores, and respiratory rates over time compared to the vehicle treatment group. The median duration of ocular viral shedding was significantly shorter in the raltegravir group compared to the vehicle group. Although the raltegravir treatment group had lower ocular viral loads in comparison to the vehicle treatment group, the difference was not statistically significant. Hemogram and serum biochemistry panel values were unremarkable throughout the study.

Oral raltegravir, administered twice daily, may be a viable treatment option to alleviate the ocular and respiratory clinical signs associated with FHV-1 infection in cats.

Supported by the Foundation for Ophthalmology Research and Education International.

Lauri-Jo Gamble, DVM, CCRP

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Institution and Location	Degree	Year
Montreal University, St-Hyacinthe, Canada	DVM	2014
Carolina Veterinary Specialists, Charlotte, North Carolina	Internship	2015
VOSM, Annapolis Junction, Maryland	Spec. Internship	2016
Cornell University, Ithaca, New York	Residency	2016-Present

Current Position
Resident, Sports Medicine and Rehabilitation, 2nd Year

Abstract Title:
Serum Metabolomics of Endurance Alaskan Sled Dogs During Racing

Authors Names:
Lauri-Jo Gamble[1], Christopher W. Frye[1], Cristina M. Hansen[2], Nicholas Berthelsen[1], Jason W. Locasale[3], Xiaojing Liu[3], Joseph J. Wakshlag[1]

[1]Cornell University, College of Veterinary Medicine, Ithaca, New York
[2]University of Alaska, Fairbanks, Alaska
[3]Duke University School of Medicine, Durham, North Carolina

Project Mentor(s):
Joseph J. Wakshlag, DVM, PhD, ACVN, ACVSMR; Department of Clinical Sciences (Mentor)
Christopher W. Frye, DVM; Department of Clinical Sciences (Co-mentor)

Abstract:
Lipid metabolism has long been thought to be the major substrate involved in sled dogs endurance racing. However, a recent study suggests that they are equally, if not more, dependent on carbohydrate metabolism. Considering the metabolic disparity, our study aimed to explore the serum metabolomic profiles of sled dogs running a 1000-mile race. We hypothesized that there would be depletion of amino acids involved in the repletion of the citric acid cycle due to need for gluconeogenesis.

Serum was obtained and frozen until analyzed from 6 Alaskan sled dogs 24 hours prior to the race, at the midrace checkpoint (480 miles), and again at the finish (983 miles). After thawing, serum samples were prepared for liquid chromatography-mass spectrometry for over 240 metabolites involved in amino acid, lipid, and carbohydrate metabolism. MetaboAnalyst Software 3.0 was then used to analyze data using one-way repeated measures analysis of variance across all metabolites with corrections for false discovery rate.

Major metabolic changes observed were enhanced acyl-carnitine derivatives compared to baseline, and depletion of nearly all amino acids except for hepatic bypass branched-chain amino acids, which were not different from baseline and were possibly enhanced. Many of the citric acid cycle intermediates exhibited variable increases and decreases. Depletion of nearly all amino acids, except for hepatic bypass branched chain amino acids suggest that sled dogs are reliant, at least partially, on protein and carbohydrate during exercise. The increases in carnitine bound fatty acid derivatives suggest a potential rate limiting beta-oxidation during endurance exercise.

Hunter (Hyun-tae) Kim, DVM, MS

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Institution and Location	Degree	Year
Kangwon National University, ChunCheon, South Korea	DVM	2011
Seoul National University, Seoul, South. Korea	Master	2015
Cornell University, Ithaca, New York	Residency	2016-Present

Current Position
Resident, Clinical Nutrition, 2nd Year

Abstract Title:
The Effects of Maltodextrin and Protein Supplementation on Serum Metabolites in Exercising Competitive Weight-Pulling Dogs

Authors Names:
Hyun-tae Kim; Cornell University, College of Veterinary Medicine, Ithaca, New York
Christopher W. Frye; Cornell University, College of Veterinary Medicine, Ithaca, New York
Gretchen M. Van Deventer; Cornell University, College of Veterinary Medicine, Ithaca, New York
Gina K. Dinallo; Cornell University, College of Veterinary Medicine, Ithaca, New York
Brian M. Zanghi; Nestle Purina Research, St. Louis, Missouri
Joseph J. Wakshlag; Cornell University, College of Veterinary Medicine, Ithaca, New York

Project Mentor(s):
Joseph J. Wakshlag, DVM, PhD, ACVN, ACVSMR; Department of Clinical Sciences (Mentor)

Abstract:
Post-exercise carbohydrate repletion of skeletal muscle utilizing maltodextrin, with or without highly digestible protein, is documented to improve performance in humans. However, there is limited evidence in improved performance other than elevations in muscle glycogen and serum amino acid responses. The objectives of this study were two-fold; 1) to examine the metabolomic changes associated with a competitive weight pulling; and 2) to examine the effects of maltodextrin/protein supplementation on serum metabolomics during recovery.

Serum was collected from 12 dogs (6 control and 6 treatment) at different time points (pre-exercise, post-exercise, 30 minutes post, 3 hours post) and Liquid Chromatography-Mass Spectrometry (LC-MS) was performed for approximately 242 metabolites. Serum glucose and insulin concentrations were also evaluated by the Cornell Diagnostic Laboratory. A two-way ANOVA for time and treatment with false discovery rate corrections was used by Metaboanalyst 3.0.

There were 9 metabolites found to be significantly increased or decreased after exercise from baseline representing primarily citric acid cycle metabolites. Treatment differences at 30 minutes showed 8 metabolites including amino acids and carbohydrate intermediates were elevated with supplementation. Twenty-eight metabolites were significantly different at 3 hours post-exercise, with most metabolites being related to increases in amino acids and related metabolites, as well as suppression of fatty acid metabolites with supplementation.

Although serum insulin and glucose showed no differences between treatment groups there are definite alterations in metabolites suggesting that post-supplementation with maltodextrin and protein support glucose metabolism and depress fatty acid metabolism during recovery from a simulated weight pulling event.

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Institution and Location	Degree	Year
The Ohio State University, Columbus, Ohio	DVM	2013
Calgary Animal Referral and Emergency Centre, Canada	Internship	2014
Cornell University, Ithaca, New York	Residency	2016-Present

Current Position
Resident, Anesthesia, 2nd Year

Abstract Title:
Evaluation of Atipamezole as Treatment for Dexmedetomidine-Induced Cardiovascular Depression in Anesthetized Cats

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Project Mentor(s):
Manuel Martin-Flores, MV, DACVAA; Department of Clinical Sciences

Abstract:
Introduction
Dexmedetomidine is a sedative agent frequently used for anesthesia in cats. One disadvantage is that it reduces heart rate (HR) and cardiac output (CO) by up to 50% and produces arterial hypertension. The α2-antagonist agent atipamezole can shorten anesthetic recovery and raise HR in awake cats. Since atipamezole produces vasodilation, this effect might be augmented in the presence of volatile anesthetics. Moreover, since general anesthetics alter the baroreflex, a reflexive increase in HR may also be blunted.

Objective
To evaluate the hemodynamic effects of two doses of atipamezole administered intramuscularly (IM) to anesthetized cats receiving dexmedetomidine.

Methods
6 purpose-bred cats were anesthetized 3 times with isoflurane. Dexmedetomidine 5 µg/kg was administered IV. Ten minutes later, either saline or atipamezole (25 or 50 µg/kg) was administered IM. The HR, direct mean arterial pressure (MAP), and CO were recorded at baseline, at peak effect after dexmedetomidine, at peak effect after treatment, and 15, 30, 60, 120 minutes post-treatment.

Results (partial)
3 cats have completed all treatments. Compared with saline, atipamezole resulted in lower HR and MAP. Arterial hypotension (MAP<60 mmHg) was observed 5/6 times after atipamezole but none after saline. The CO did not improve compared with saline.

Conclusion
Atipamezole causes substantial vasodilation but only minimal improvement in HR and CO when administered under general anesthesia in cats. These preliminary results raise awareness of the potential deleterious consequences of using atipamezole to treat dexmedetomidine-induced cardiovascular depression under general anesthesia.

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Institution and Location	Degree	Year
Montreal University, St-Hyacinthe, Canada	DVM	2014
Carolina Veterinary Specialists, Charlotte, North Carolina	Internship	2015
VOSM, Annapolis Junction, Maryland	Spec. Internship	2016
Cornell University, Ithaca, New York	Residency	2016-Present

Current Position

Resident, Sports Medicine and Rehabilitation, 2nd Year

Abstract Title:

Pilot Study on Pharmacokinetics, Safety, and Clinical Efficacy of Cannabidiol Treatment in Osteoarthritic Dogs

Authors Names:

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Project Mentor(s):

Joseph J. Wakshlag, DVM, PhD, ACVN, ACVSMR; Department of Clinical Sciences (Mentor)
Christopher W. Frye, DVM; Department of Clinical Sciences (Co-mentor)
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Abstract:

In the absence of an ideal treatment for chronic pain associated with osteoarthritis, there is an interest for cannabinoid derivatives, yet minimal scientific evidence regarding efficacy or safety in dogs. The objectives of this ongoing study were to determine the (1) basic oral pharmacokinetics, (2) general short term safety, and (3) efficacy of a novel cannabidiol extract (CBD) in dogs with multi-joint osteoarthritis.

A basic 24-hour oral pharmacokinetic study was performed at 2 different dosages (2mg/kg and 8mg/kg). Thereafter, sixteen client-owned dogs completed a placebo-controlled double-blind cross-over study. Dogs were randomly receiving CBD oil (2mg/kg ml/kg q12) or placebo oil for 4 weeks with 2 weeks washout period before cross-over. Veterinary assessments as well as owner questionnaires were completed at weeks 0, 2, and 4 for both oils.

Oral pharmacokinetics showed that half-life of elimination was 4.7 ± 1.2 hours with a 2 mg/kg dose. No obvious psychoactive properties were observed on neurological evaluation at any time point. On the clinical assessment, CBPI and Hudson scores showed a significant decrease in pain and increase in activity ($p \leq 0.01$) at week 2, while only Hudson activity indices were improved at week 4 for CBD oil ($p \leq 0.01$). ALP increased over time for 8 dogs while receiving CBD oil, reaching significance at week 4 ($p \leq 0.01$). We conclude that dogs with osteoarthritis receiving CBD oil are perceived to be more comfortable and active with very few undesirable side effects detected when compare to a placebo oil.

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Institution and Location	Degree	Year
Drexel University, Philadelphia, Pennsylvania	MLAS	2012
The Ohio State University, Columbus, Ohio	DVM	2016
Kansas State University, Manhattan, Kansas	Internship	2017

Current Position
Intern. Companion Exotics, Wildlife and Zoo medicine

Abstract Title:
Plasma Amylase and Lipase Concentrations in Captive Black-Tailed Prairie Dogs (*Cynomys Ludovicianus*)

Authors Names:
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Project Mentor(s):
Dr. David Eshar; Kansas State University, Manhattan, Kansas
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Abstract:
Introduction
The black-tailed prairie dog (*Cynomys ludovicianus*) is one of five species of prairie dogs, a keystone species in the grasslands of North America. They are kept in zoological collections, research facilities, and as privately-owned pets. This herbivorous, burrowing animal is a member of the order Rodentia and the family Sciuridae. Although several studies have described hematologic and physiologic parameters in the black-tailed prairie dog, none have reported amylase or lipase concentrations in this species.

Objective
This study was conducted to determine plasma amylase and lipase concentrations in captive black-tailed prairie dogs.

Methods
Twenty-six healthy, captive prairie dogs of both sexes were studied as part of an overall health evaluation performed under isoflurane anesthesia. Each animal underwent a physical examination, complete blood count, plasma biochemistry, and blood gas analysis. Venous samples were placed in heparinized blood tubes and were submitted for analysis. The amylase and lipase enzymatic colorimetric assays were used to obtain a quantitative measurement of plasma enzyme concentrations by an automatic wet biochemistry analyzer. Data analysis was performed according to the guidelines published by the American Society for Veterinary Clinical Pathology.

Results
The reference interval for amylase was 111.3-499.1 IU/L, and the mean and median plasma amylase concentration were 323.2 IU/L and 341 IU/L respectively (min=152 IU/L, max=481 IU/L). The reference interval for lipase was 25.7-78.4 IU/L, and the mean and median plasma lipase concentration were both 49.5 IU/L (min=27 IU/L, max=80 IU/L). The new data presented in this report can promote better physiological understanding and improve clinical management of this species.

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Institution and Location	Degree	Year
Tufts Cummings School of Vet. Med., Grafton, Mass.	DVM	2015
Oklahoma State University, Stillwater, Oklahoma	Internship	2015
Cornell University, Ithaca, New York	Internship	2017
Cornell University, Ithaca, New York	Residency	2017-Present

Current Position

Resident, Exotic, Zoo, and Wildlife Medicine, 1st Year

Abstract Title:

Prevalence of Anticoagulant Rodenticide Exposure in Red-Tailed Hawks (*Buteo Jamaicensis*) in New York State and Diagnostic Utility of Russell Viper Venom Test for Detecting Associated Coagulopathies

Authors Names:

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Project Mentor(s):

Noha-Abou-Madi, DVM, MS, Dipl. ACZM; Department of Clinical Sciences

Abstract:

Introduction

Free-ranging red-tailed hawks (*Buteo jamaicensis*) are commonly exposed to anticoagulant rodenticides (ARs) through contaminated prey. Coagulation tests suitable for detecting AR-related coagulopathy in raptors are not routinely available, potentially resulting in underdiagnosed AR-related coagulopathy.

Objective

The aims of this study were to assess the prevalence of AR exposure in free-ranging *B. jamaicensis* in New York State (NYS), and investigate Russell's viper venom time (RVVT) as an affordable, practical coagulation test. Blood was collected from a control group of *B. jamaicensis* (n=14) and a study group of sick *B. jamaicensis* presented to the Cornell University Wildlife Health Center (n=39). Liver was collected from a subset of hawks. A toxicology screen as performed to detect AR compounds, and two clotting time tests to identify coagulopathies: prothrombin time (PT), and RVVT.

Results

Of the 35 birds tested, 12 (34%), had detectable AR concentrations in liver (brodifacoum in 11/12 (92%); difethialone in 1/12 (8%)) or blood (brodifacoum in 2/35 (6%)). Birds with detectable AR concentrations had clotting times not different from controls. Birds without detectable concentrations had shorter PT ($P<0.004$) but not RVVT ($P=0.06$). The RVVT and PT correlated in the birds tested ($rho=0.6$). Using a reference threshold of 40sec for PT, and 50sec for RVVT, RVVT was sensitive, but non-specific for detecting coagulopathies. Birds with markedly prolonged RVVT (>100sec) are likely coagulopathic. RVVT might provide a practical test to rule out AR exposure, but prolonged RVVT test results warrant additional testing, in a population of raptors still highly exposed to AR.

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Institution and Location	Degree	Year
University of Missouri, Columbia, Missouri	DVM	2015
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Cornell University, Ithaca, New York	Residency	2016-Present

Current Position
Resident, Laboratory Animal Medicine, 2nd Year

Abstract Title:
Ethanol as an Alternative to CO_2 for Euthanasia of Chickens (*Gallus Gallus Domesticus*) and Zebra Finches (*Taeniopygia Guttata*)

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Erica Lachenhauer; Cornell University, Department of Biomedical Sciences, Ithaca, New York
Wendy O. Williams; Cornell University, CARE, Ithaca, New York
Elizabeth Buckles; Cornell University, Animal Health Diagnostic Center, Ithaca, New York
Erin Daugherity; Cornell University, CARE, Ithaca, New York

Project Mentor(s):
Erin R. Daugherity, DVM, MS, DACLAM; CARE (Mentor)
Wendy O. Williams, DVM, DACLAM, CARE (Co-mentor)

Abstract:
Injectable pentobarbital and inhalant CO_2 are the current 'acceptable' and 'acceptable with conditions' for euthanasia of avian species. However, barbiturates are controlled substances and thus challenging to use in the field and laboratory setting. Additionally, there is limited literature on the use of CO_2 in avian species and flow rates are extrapolated from mammalian studies. Ethanol is a potential alternative euthanasia agent due to its pharmacological properties and accessibility. We hypothesized that ethanol would be equivalent or superior to pentobarbital as a means of euthanasia in chickens (*Gallus gallus domesticus*) and zebra finches (*Taeniopygia guttata*). Birds were randomized into three groups, receiving either 100% ethanol, saline, or pentobarbital intracoelomically, and all chickens were monitored with ECG, capnography, and pulse oximetry. Chickens receiving either pentobarbital or ethanol both exhibited a smooth transition into a surgical plane of anesthesia, with 5/7 ethanol birds declared euthanized at approximately 10 minutes, and 5/7 pentobarbital birds declared euthanized at approximately 7 minutes following injection. In chickens euthanized by ethanol, loss of respiration occurred prior to cardiac arrest, which was confirmed by capnography following loss of consciousness. In zebra finches, 16/17 (ethanol) and 16/17 (pentobarbital) were euthanized in <5 minutes post injection. Neither species in the ethanol and pentobarbital groups exhibited overt signs of distress. In summary, the data suggests 100% ethanol is equivalent and/or superior to pentobarbital because it quickly and repeatedly induces a smooth anesthetic induction, results in minimal to no signs of distress, and achieves a deep plane of anesthesia prior to death.

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Institution and Location	Degree	Year
Drexel University, Philadelphia, Pennsylvania	MLAS	2012
The Ohio State University, Columbus, Ohio	DVM	2016
Kansas State University, Manhattan, Kansas	Internship	2017

Current Position
Intern. Companion Exotics, Wildlife and Zoo Medicine

Abstract Title:
Reference Intervals for Plasma Biochemical Parameters in Captive Black-Tailed Prairie Dogs (*Cynomys Ludovicianus*) Using Point-Of-Care Testing

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Project Mentor(s):
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Abstract:
Introduction
The black-tailed prairie dog (*Cynomys ludovicianus*) is an herbivorous member of the family Sciuridae of the order Rodentia. This species serves as a common research model, collection animal, and privately-owned pet. As the popularity of the prairie dog increases, the need for validated reference ranges grows.

Objective
This prospective study was conducted to establish reference intervals for biochemical parameters in clinically healthy, captive black-tailed prairie dogs using point-of-care testing according to ASVCP guidelines. We hypothesized that biochemical analytes would be influenced by both age and gender. A specific goal was to determine if agreement of biochemical parameters exists between two analyzers: the VetScan (VS2) and the Cobas c501. We hypothesized no agreement would exist between the two testing methodologies.

Methods
Forty-one captive black-tailed prairie dogs were used: 16 females and 25 males varying in age were studied as part of an overall health evaluation performed under anesthesia. Venous samples were collected and placed in heparinized tubes for analysis. This study utilized the VS2 point-of-care analyzer, recording 14 biochemical analytes on the Comprehensive Diagnostic Profile.

Results
Eight biochemical analytes were influenced by age. Glucose, BUN, Phosphorus and ALP were significantly lower in older animals. Total Protein, Globulin, Sodium, and Total Bilirubin were significantly higher in older animals. Two biochemical analytes were influenced by gender. Albumin and Creatinine were both significantly higher in females. Agreement statistics between the Cobas c501 and VS2 determined that there was statistically significant bias. Only 3 analytes, BUN, Calcium and Sodium, had agreements that were within clinical allowable error limits.

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Institution and Location	Degree	Year
Murdoch University, Western Australia	BSc, BVMS	2006
Cornell University, Ithaca, New York	Residency	2016-Present

Current Position
Resident, Dentistry and Oral Surgery, 2nd Year

Abstract Title:
Clinical and Radiographic Abnormalities Associated With Retained Tooth Roots in Dogs

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Project Mentor(s):
Santiago Peralta, DVM, Dipl. AVDC, Department of Clinical Sciences

Abstract:
Introduction
Retained tooth roots (RTR) are common in dogs, and are believed to predispose to apical periodontitis, draining tracts, and local swelling. The objectives of this study were to describe the clinical and radiographic findings associated with RTR in dogs, and determine whether RTR dimensions and relative location are associated with abnormal clinical and radiographic findings. We hypothesized that larger RTR, and RTR that protrude through the alveolar bone, are more likely to cause abnormalities.

Materials and Methods
39 dogs diagnosed with at least 1 RTR based on clinical and radiographic assessment were included in this study. The length and width of each RTR present was measured digitally. The location of each RTR in relation to the alveolar margin was recorded. Radiographic evidence of marginal or apical periodontitis was recorded. The associated gingiva was inspected for the presence of inflammation, draining tracts or visibility of the retained root fragment. Variables were compared to establish possible associations.

Results
The mean number of RTR per dog was 2.4 (median: 2, range: 1-13). The mean length and width of RTR identified were 6.6±3.6mm and 2.7±1.2mm, respectively. The most frequently affected teeth were the premolars (58%). Overall, abnormal findings were present in 52.1% of RTR. For every 1-mm increase in length of RTR, the odds of finding either abnormal radiographic or clinical findings increased by a factor of 1.26 (95% CI: 1.09-1.5; $p < 0.01$).

Conclusions
Abnormal clinical or radiographic findings were present in the majority of RTR. Longer roots were more likely to cause clinical and radiographic abnormalities.

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Institution and Location	Degree	Year
University of Tennessee, Knoxville, Tennessee	DVM	2012
University of Missouri, Columbia, Missouri	Internship	2013
Long Island Veterinary Specialists, Plainview, New York	Internship	2014
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Cornell University, Ithaca, New York	Residency	2015-Present

Current Position

Resident, Neurology, 3rd Year

Abstract Title:

Syringobulbia in Dogs

Authors Names:

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Project Mentor(s):

Sofia Cerda-Gonzalez, DVM, DACVIM (Neurology), Department of Clinical Sciences

Abstract:

Introduction

Craniocervical junction abnormalities can result in a physical constriction of the foramen magnum. This causes pressure changes and alters the cerebrospinal fluid flow (CSF) making it turbulent, which results in syringomyelia. In humans with syringomyelia, syringobulbia, a fluid-filled cavity in the medulla usually communicating with the lumen of the fourth ventricle, is a rare sequela. Currently, there are no reports in veterinary literature describing syringobulbia in dogs.

Objective

To describe the clinical presentation, disease progression, magnetic resonance imaging (MRI) findings and outcomes of dogs with presumptive syringobulbia.

Methods

A retrospective case series from 2012 to 2017 identified four canine cases with craniocervical junction abnormalities and syringobulbia that had been diagnosed via MRI.

Results

Four dogs presented with neurologic signs consistent with central vestibular disease and 3/4 dogs presented acutely. Age of presentation was 13 months to 107 months; however, in the dog that presented at 107 months, vestibular signs had been slowly progressive since 4-months of age. MRI findings in all cases initially demonstrated ipsilateral slit-like or bulbous CSF-filled cavities of the myelencephalon. One dog, on repeat MRI, demonstrated disease progression resulting in an additional unilateral hypoglossal neuropathy contralateral to the original syringobulbia lesion. In 2 of the 4 dogs, medical management was elected with a combination of steroids, pain medication and proton pump inhibitors; the other 2 dogs had surgery to address their clinical signs.

Conclusions

Syringobulbia occurs in dogs and medical or surgical management may be acceptable options depending on the individual case presentation and disease progression.

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Institution and Location	Degree	Year
Kwame Nkrumah University of Science and Tech., Ghana	DVM	2015
Cornell University, Ithaca, New York	Residency	2017-Present

Current Position
Intern, Clinical Pathology

Abstract Title:
Validation of an Equine Stall-Side Major Crossmatch Test

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Project Mentor(s):
Tracy Stokol, BVSc, PhD; Department of Population Medicine and Diagnostic Sciences (Mentor)
Gillian Perkins, DVM, Diplomate ACVIM; Department of Clinical Sciences (Co-mentor)

Abstract:
Blood transfusion is a vital tool in equine critical care, necessary for the treatment of severe anemia due to blood loss and hemolysis. A blood transfusion between incompatible horses can cause transfusion reactions, which can be life-threatening. A cross-match can be done prior to a blood transfusion to assess compatibility, however, the currently used standard of laboratory crossmatch procedure is time consuming, costly, requires technical expertise and is not readily available to the equine practitioner. A new stall-side gel crossmatch kit has been developed for horses. However, this kit has not been independently validated. If this kit can identify blood type incompatibilities, it would allow veterinarians to find appropriate blood donors, thus permitting safe blood transfusion in the field.

Our goal is to determine the sensitivity and specificity of a stall-side crossmatch kit in comparison to the current laboratory standard. Blood from 11 horses at the Cornell Equine Research Park that have already been blood typed and antibody screened, will be used in this study. We will perform crossmatch combinations of the horses' serum and red blood cells to yield predicted strong and weak positive as well as negative reactions. Crossmatches will be performed on the same day by blinded investigators and independently verified. Results will be scored categorically using standard criteria.

We expect the stall-side test will be fast and easy to perform and will be able to detect incompatible crossmatches with both weak and strong reactions on the laboratory gold standard.

Rachael N. Labitt, DVM

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Institution and Location	Degree	Year
Cornell University, Ithaca, New York	DVM	2017
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Current Position
Resident, Laboratory Animal Medicine, 1st Year

Abstract Title:
Consequences of Subtherapeutic Antibiotic Environmental Contaminants in a Zebrafish (*Danio Rerio*) Model

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Project Mentor(s):
Hélène Marquis, DVM, PhD, Department of Microbiology & Immunology

Abstract:
Antibiotic resistance is an increasing threat to human and animal health. Antibiotics are found within water sources throughout the world, since most antibiotics are excreted unmetabolized. Despite being found in levels too low to inhibit growth in vitro, subtherapeutic levels of antibiotics are not innocuous: they promote biofilm formation, mutagenesis, alterations of metabolism and virulence, and resistance. Preliminary experiments show that the mean inhibitory concentration calculated in vitro is higher than the concentration needed to inhibit growth in in vivo models, demonstrating a need for in vivo aquatic models of antibiotic exposure. We hypothesize that zebrafish (*Danio rerio*) exposed chronically to subtherapeutic levels of antibiotics will show effects of antibiotic exposure, including decreased gut microbiota, increased bacterial resistance, and increased colonization with pathogenic bacteria. We will investigate antibiotics of human and veterinary importance (ciprofloxacin, erythromycin, and sulfamethoxazole) at concentrations observed contaminating natural waterways. Zebrafish will be maintained in water treated or not with antibiotics for eight weeks duration. Every two weeks, a subset of fish will be euthanized and the intestines harvested. Microbiota content and proportion of resistant bacteria will be assessed by plating and qPCR. Fish with chronic antibiotic exposure will be challenged with the zebrafish pathogen Vibrio parahaemolyticus or the human pathogen Vibrio cholera, and colonization will be measured by bacterial isolation and PCR identification. We seek to determine if chronic exposure to subtherapeutic doses of antibiotics has adverse effects on intestinal microbiota, emergence of resistance, and susceptibility to pathogens that threaten both aquatic life and public health.

Notes